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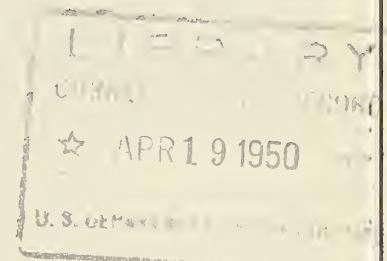
**BASE-SURPLUS PLAN
IN THE MADISON, WIS., MILK MARKET**

By

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and

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TABLE OF CONTENTS

	<u>Page</u>
Summary and conclusions	
History of milk marketing in the Madison market-----	2
The Madison Milk Producers Cooperative Association-----	2
Producer marketing and manufacturing activities-----	3
The market and market supply-----	3
Principles and objectives of a base-surplus plan-----	5
Frequency of setting bases-----	6
Varying treatment for new producers-----	8
Current adjustments and transfers differ-----	8
Timing and length important-----	9
Other variations noted-----	9
Analysis of the Madison base-surplus plan-----	9
Seasonality before and after adoption of plan-----	9
Comparison of seasonal variations of three 5-year periods-----	12
Seasonality of Madison producers compared with other producers-----	15
Individual producer response and freshening schedules-----	17
Seasonality of Groups A and B-----	17
Seasonal distribution of cow freshenings for Groups A and B-----	19
Position in market of Groups A and B under plan-----	21
Economic consequence of adjusting to more level production-----	23

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SUMMARY AND CONCLUSIONS

Volume of milk production in the Madison, Wisconsin, market varied greatly from season to season before a base-surplus plan was adopted by the Madison Milk Producers Cooperative Association. This meant the market was confronted with a serious seasonal problem - burdensome surpluses in the spring months and actual shortages in the fall.

This study shows that the base surplus plan has helped solve this seasonal surplus problem. Under this plan producers are paid the top market price for "base" milk and a lower price for milk delivered in excess of the base. "Base" milk represents the producer's average production during the base forming period. This period is generally the 3 to 6 months of the previous year when production in the market as a whole is lowest.

In brief, the plan has had the following effects:

1. Production in the spring months has been reduced considerably while fall and early winter production has gone up considerably. This has meant a marked evening-out of production over the 16 years the plan has been in effect.
2. This more uniform production pattern showed up soon after the plan was adopted. Most of the producers responded quickly. In the first 3 or 4 years of the plan's operation, they adjusted the time of year when their cows were bred.
3. Producers who evened out their production appear to have increased their gross income from milk sales. Under certain assumed conditions in this market, an increased annual return of about \$80 for the average producer was worked out. This figure, of course, varies from producer to producer.
4. An analysis of two groups of farmers shows that the group making marked adjustments in seasonal production had 34 percent of all their cows freshen in July, August, and September and the other group which made little adjustment had only 17 percent of their cows freshen in the same 3 months.

Important contributing factors to the success of the base-surplus plan include the high degree of membership loyalty, the fact that the plan was thoroughly discussed with and generally accepted by members before being put into operation, and its flexibility. Because of the plan's flexibility frequent and complex changes are avoided but minor changes in policy and procedure are made when warranted.

This report also discusses in some detail the principles and objectives of a base-surplus plan. It shows how the plan may be modified to fit various market conditions. Among other things, certain markets set new bases more often than others, treat new producers differently, use different timing and lengths for the base-forming period, and coordinate

the base plan more closely than others with other phases of the marketing program.

This study also gives a brief history of the Madison Milk Producers Cooperative Association and of milk marketing practices in the Madison market. It points out that in addition to adopting the base-surplus plan to handle seasonal surpluses, the cooperative in 1934 established its own facilities to manufacture Swiss cheese, using mostly surplus milk in its production.

It offers the following suggestions for maintaining and improving the results already achieved under the base-surplus plan:

1. To bring about the best adjustment in production from the seasonal standpoint it appears desirable to maintain sufficient seasonal variations in prices paid to producers.
2. Some adjustments are needed to reduce the base allotments of producers who have increased their bases to a point well above their average monthly production for the year. In effect, this suggests the desirability of a penalty in the event of underbase deliveries.
3. A general educational program should be undertaken to reacquaint nonmembers as well as members with the plan and to help them with their feeding, breeding, and management problems.
4. This cooperative has made significant progress in handling surpluses to advantage by processing and selling to other markets. This attempt to cope with the problem should be continued and expanded if future conditions indicate an economic need for greater facilities.

This continued success of the base surplus plan will, in any event, depend upon the full support of all groups in a cooperative spirit.

BASE-SURPLUS PLAN IN THE MADISON, WISCONSIN MILK MARKET

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With the return of more normal conditions, dairymen and other segments of the milk industry are again faced with certain marketing problems created by the fluctuation of milk production from season to season. In the usual course of things, the spring and early summer season sees cows giving more milk than any other season of the year. This is because a large proportion of the cows have just recently freshened and because of lush pastures available. That means a market flooded with milk, because consumer demand remains about the same all year.

Producers then quite naturally find themselves faced with lower prices for their greater volume of milk. Sometimes they haven't been able to sell all their milk even at lower prices in this flush season. Then in the fall and winter when volume of milk production falls off, they see prices moving up again.

Measures to correct this problem are receiving considerable attention from cooperative milk bargaining associations. The present study traces the development and evolution of the base-surplus plan in the Madison, Wisconsin, market from 1929 to 1947, inclusive. It shows how this plan has been used effectively to encourage level milk production season after season. In simple terms, a base-surplus plan distributes proceeds from sale of milk among producers according to their individual pattern of production. Each farmer gets the monthly base price during the year following the base earning period. For all milk delivered over this base, each farmer receives a lower price.

The Madison Milk Producers Cooperative Association, Madison, Wisconsin, first attacked this problem of seasonality of production - that is, the production of much greater volume of milk in the spring and early summer, with a corresponding drop in volume during fall and winter months - by use of seasonal changes in price. This didn't work too well because unless a considerable price advantage was offered, few producers would try

NOTE: The first draft of this report was prepared by Mr. Stocker while a graduate student at the University of Wisconsin in partial fulfillment of the requirements for a Masters Degree. Special acknowledgment is due Dean R. K. Froker of the University of Wisconsin for his aid in planning the study and for his stimulating criticism throughout, and to Harvey Thew, Manager of the Madison Milk Producers Cooperative Association for his generous assistance in personal interviews and in making available the data needed for this study.

very hard to adjust their breeding programs so more cows would freshen in the late summer or early fall. So they adopted the base-surplus plan discussed in this report to get a more even volume of milk the year around.

Soon after the base-surplus plan was adopted the cooperative also attacked this seasonal surplus problem by building a Swiss Cheese plant. This plant takes care of much of the surplus that still remains on the market.

Pasture conditions and supplemental feeding, especially during these late summer and fall months, are also important factors affecting the seasonal production. Temperature changes and herd management practices are also likely to be important. It was not possible, however, to analyze just how much these factors contributed to the more level production pattern achieved by the producers who evened out their volume.

Most of the data on which this study is based came from the files of the Madison Milk Producers Cooperative Association. These data do not in all instances cover the entire market, but are believed to cover a sufficient segment to be representative of the entire market.

HISTORY OF MILK MARKETING IN THE MADISON MARKET

THE MADISON MILK PRODUCERS COOPERATIVE ASSOCIATION

The Madison Milk Producers Cooperative Association, organized in 1923, was modeled to a great extent after previously organized producer groups in the area. The first association secretary was a farmer-member. There were no full time employees for several years. The original contract for members, drawn up in 1923, actually provided for a more or less automatic membership for all producers who sold to distributors with whom the cooperative dealt.

It was soon apparent that the association did not represent a high enough percentage of the producers on the market to guarantee the effective bargaining necessary to stabilize the market. In these early years it was often the policy of dealers in the market to take on producers in the fall when additional milk was needed and to shut them off in the spring.

This insecure position finally led to a new membership agreement and contract in 1929. It became effective when 80 percent or about 360 members signed the agreement. This number was reached after a concerted 3-month membership campaign. The new program included the base-surplus plan. This agreement did not guarantee a market to members, but producers agreed to market all milk produced through the association. This contract was apparently satisfactory since it was still in use in 1947.

Since 1929, as a result of improved production and marketing conditions, there have been very few producers shut off the market for reasons other than sanitation and the low quality of milk delivered. Only relatively few producers have discontinued sales for other reasons.

In the early years covered by this study there were two producer associations in the market, as well as a substantial number of producers who did not belong to either association. The two associations consolidated in 1941. With the growth in membership since, over 90 percent of all producers delivering milk to the market now belong to the association.

From the beginning the association promoted a farm sanitation and milk-quality program, continually exerting pressure on members to improve quality. This program included efforts to get members to give more attention to cleanliness of equipment, buildings and personnel. It also emphasized proper cooling practices in conjunction with milk house construction in the early years. The combined effect of all these activities on market stability has been significant. Dealers appreciate the high-quality raw product and its desirable effect on consumption. This has probably strengthened the bargaining position of the association considerably and aided materially in raising prices to producers over the years.

PRODUCER MARKETING AND MANUFACTURING ACTIVITIES

In addition to the marketing program involving the base-surplus plan begun in March 1929, the association has engaged in other activities in an effort to handle the seasonal surplus. In the depression years of 1931-1933 mainly, the association marketed considerable amounts of surplus milk, by arrangement with Madison dealers, at nearby condensery plants.

The cooperative took what proved to be an important step in further stabilizing the market in the winter of 1933. At that time the producers voted to establish their own facilities to manufacture excess milk, largely seasonal surplus. Accordingly, the Madison Milk Producers Cooperative Dairy was organized with stock membership to convert surplus milk into a high quality Swiss Cheese. This factory has been most successful. Since its beginning, collective bargaining with city distributors has been confined primarily to fluid milk and cream. The operation and success of the surplus plant has undoubtedly been instrumental in raising returns to producers for milk delivered in excess of fluid needs of the city. It probably also has exerted a stabilizing effect on the market generally.

THE MARKET AND MARKET SUPPLY

Madison is a city of about 82,000 population according to current estimates. The city has grown rapidly and indications are that steady growth will continue for some time. The current estimate of 82,000 does not include over 15,000 nonresident students of the University of Wisconsin, which actually brings the total to nearly 100,000 for most of the year.

Madison is centrally located in Dane County. Dairying is by far the most important agricultural industry in the county. Milk is marketed through creameries, condenseries, cheese factories, and city markets. Farmers in the southwestern and western parts of the county sell to Swiss and Limburger cheese factories.

Wisconsin Crop and Livestock Reporting Service records show that in 1948 Dane County led all other counties in the State in total milk production with 643 million pounds.¹

Madison is thus situated in a heavy milk producing area. Probably over 95 percent of the producers supplying the market are situated within a 12 to 15 mile radius of the State capital.

Madison price data and market information dating back to 1922 show that at that time dealers were paying for milk on a flat price system. Dealers did not pay farmers for milk under a classified plan basing the price on how they used the milk. They did not pool the proceeds and did not reward producers for uniform production.

In 1927 producers and dealers agreed on a pricing plan which tied the fluid price paid to producers directly to the Chicago butter price, and provided for an additional amount, adjusted somewhat seasonally, over the approximate butter value of the milk.

In computing the fluid milk price under this plan, the average Chicago wholesale 92 score butter price for the month was multiplied by 3.5. To this was added a differential averaging about 75 cents per hundred-weight for the year to determine the price per 100 pounds of milk testing 3.5 percent butterfat. The 75 cents differential per 100 pounds was more or less arbitrarily based on 25 cents as the value of the skimmed milk in each 100 pounds of whole milk, 25 cents for the better quality milk produced by farmers selling for fluid purposes and 25 cents for hauling expenses. No other recognition was given to overrun in the manufacture of butter or to manufacturing and marketing costs.

The differential varied from a low of 55 cents during May and June to a high of 95 cents during September, October, and November. This seasonal variation in price was introduced to encourage a more uniform seasonal pattern of production. The results achieved were unsatisfactory, however, for dealers as well as the producer group were convinced by 1929 that something more than seasonal price changes were necessary to alter the extreme seasonal production of milk.

Producers as a whole apparently were willing to try any plan that promised to encourage more uniform production, providing the returns from the sale of their milk would be distributed equitably. Producers felt

¹Wisconsin State Department of Agriculture, Wisconsin Crop and Livestock Reporter, Vol. 28, No. 4, April 1949, p.3.

that unless the cooperative offered a considerable price advantage for more uniform production, few producers would make a conscientious effort to adjust their breeding programs so that more cows would freshen in the late summer and early fall months. A base-surplus plan was therefore adopted.

PRINCIPLES AND OBJECTIVES OF A BASE-SURPLUS PLAN

Fluid milk consumption in most markets exhibits a marked degree of uniformity from one season to the next. The purpose of a base-surplus plan is to encourage a similar pattern of production.

Under such a plan each farmer earns an allotment or quota, usually referred to as his base. This is commonly determined by computing an average of the producer's deliveries during the months of lowest production for the market as a whole. In most fluid milk markets this period comes in the fall months. For example, if over a period of years the supply of milk in the months of September, October, and November is in closer balance with the fluid demand than any other period, then these months are set aside as "base months" and constitute the base-forming period for all producers participating in the plan.

Each producer's average monthly production during the base-forming months then becomes the established base for which he is paid a base price the following 12 months. On the other hand, for all milk produced over his base, each farmer is paid a lower price.

This provides an incentive for farmers to increase their fall production in comparison to spring production in order to get the additional money they see those with higher bases getting.

Many forms or modifications of the base-surplus plan are now used. The details of plans adopted in different markets have been changed from time to time to meet the peculiar and varying circumstances of each market. Although the underlying principles are common to all, no one plan has been devised which will fit into all market structures and operate smoothly and equitably for all concerned. These plans have been given a variety of names as a result of this wide diversity in form. They are referred to as base-surplus, base and excess, base plans, surplus plans, rating plans, quota plans, and base allotment, among others. In the Madison market the plan is known as "base-surplus."

The principal points of variance in the base plans are as follows:

1. The frequency with which entirely new bases are established.
2. The treatment accorded new producers.
3. The extent to which current adjustments and transfers in bases are made.
4. The timing and length of the base-forming period.

5. The extent to which total bases exceed fluid milk sales.
6. The number of months during the year in which bases are used.
7. The extent to which the base plan is related to other phases of the marketing program of the local association.

FREQUENCY OF SETTING BASES

The frequency with which new bases are established - the first point - is a feature that varies widely among markets, and to a lesser extent within a given market from time to time. Generally speaking, there are three fairly distinct forms of policy with respect to this feature. They are commonly termed open-base, closed-based, and semi-closed base.

Under a strict open-base policy, each producer receives an entirely new base each year to replace his previously established base. Although this plan has the distinct advantage of holding producer discontent to a minimum, the majority of markets that commenced this system have usually deviated from it after several years. This was especially true during the period of falling demand and decreased fluid milk sales during the early 1930's.

A policy of completely open-bases may tend to defeat the main purpose of the entire plan. Producers may tend to overdevelop their bases by increasing production in the base months to a point out of line with their production the rest of the year. It would be possible for producers to alter their production pattern by merely changing the period of surplus from the spring to the base period in the fall. This condition could, of course, be curbed by forfeiture of base allotments not covered throughout the year.

The other extreme in policy, the closed-base system, may cause even more undesirable effects. The essential feature of the closed-base is that producers are assigned the same base year after year. These rigid bases are often assigned to producers during the first year of operation under the plan, and may be an average of past production in the base months of 1, 2, or more years immediately preceding the institution of the plan. This policy has the effect then of freezing the status quo. It invariably has resulted in producer dissatisfaction, especially among those with small bases who are unable to increase them. Such policy does not permit normal changes to take place among producers.

In some markets bases have been closed or frozen following several years of open-base policy. That is, more uniform production was often forthcoming under an open-base policy, but total bases would increase to undesirable levels, sometimes in the face of decreased fluid consumption. Under such circumstances the bases would often be declared closed in an effort to hold down total production. Some associations operating under the closed-base policy have followed the practice of granting base adjustments to producers on a case basis in the event of hardship.

The semi-closed base policy has been a practice of many cooperative marketing associations. The Madison plan during its first 15 years of operation adhered closely to this scheme. The base was neither completely open or completely closed. Producers had a limited opportunity each year to increase their bases.

When the cooperative started using a base-surplus plan in March 1929, it determined bases by averaging the monthly milk deliveries during the previous September, October, and November. During the first 3 years of operation under the plan, a substantial "tolerance" over producers' earned bases was permitted, that is, producers could produce something over the quota and all milk in excess of the allotted base plus tolerance was paid for at a straight manufactured milk price. In the spring of 1931 the cooperative announced that the bases would be determined on a 3-year moving average with no tolerance. The months used for determining base remained as before - September, October, and November.

This procedure was followed for the next several years. Then in August 1934 producers were advised that no new bases would be established, that the bases for the current year would be continued. This step was taken to prevent further expansion of bases, the total of which already exceeded fluid milk sales in the market. Because of the general drought conditions, the cooperative considered that this would be more equitable. It was in 1934 also that the association established its own facilities for handling the surplus milk in the market.

In January 1936 Madison Milk Producers again changed its method of computing base. Its new formula weighted the old base by four and the production during the base forming months of the previous year by one. Thus, the base for the year beginning January 1, 1936, for a producer whose previous base had been 5,000 pounds per month and whose average monthly production during September, October, and November 1935 was 6,000 pounds would be 5,200 pounds.

$$5,000 \times 4 = 20,000$$

$$6,000 \times 1 = \underline{6,000}$$

$$26,000 \div 5 = 5,200$$

The effect of this new formula was to introduce a semi-closed base policy. It gave producers a limited opportunity to increase their base each year, but under the formula the maximum increase a producer could attain was one-fifth of the difference between his old base and his production during the last base-forming period. Any loss of base a producer might sustain was limited to the same extent. This method of computing bases was continued throughout the remainder of the period covered by this study.

In June 1943 because of wartime conditions of demand and supply, the association stopped using the base-surplus plan for paying producers. It resumed use of the plan in May 1947. It continued to calculate bases each year, however, during the war. August was added as a base forming month in the fall of 1943.

VARYING TREATMENT FOR NEW PRODUCERS

Cooperatives in different markets use different methods for assigning bases to new producers. The common procedure is to grant new producers only partial recognition and privileges for a certain length of time. W. C. Welden and L. F. Herrmann in a survey found:²

"There is almost always a probationary period of from 1 to 6 months for new producers coming on the market, during which time they are paid surplus prices for all their milk.... After this period they are assigned a base or quota calculated as some percentage of their average deliveries during the probationary period. This percentage equals or is lower than the ratio of base deliveries to total deliveries for the shippers already in the market."

Some associations enforce still heavier penalties on new producers - the main idea behind these practices is to retard the entry of new producers. Furthermore cooperative officials undoubtedly hope that such policies will tend to hold back the entry of producers whose milk is not needed in the market.

The Madison Plan is not unique in this respect. Up until about 1935, the association was in a relatively weak position in more ways than one. Dealers usually took on certain "desirable" producers almost at will, assigning them a favorable base as soon as they entered the market. Such practices were effected in many cases quietly, and through personal arrangements and agreements between individual producers and the dealer seeking his supply, without the direct consent of association officials.

Abuses of this nature however were called to the attention of the State Department of Agriculture and Markets. Finally in 1935 through its Milk Control Division, this department set up certain prescribed rules and regulations for the producer cooperative and dealers alike in the assignment of bases to new producers entering the market. These regulations have been amended twice, in 1941 and in 1943. They were written in joint conference of the cooperative and the dealers.

CURRENT ADJUSTMENTS AND TRANSFERS DIFFER

Cooperatives in various markets handle individual base adjustments and transfers differently. Such matters can be a constant source of membership dissatisfaction and trouble. Usually the association sets up

²Welden, W. C. and Herrmann, L. F. Base Allotment or Quota Plans Used by Farmers' Cooperative Milk Associations. Farm Credit Administration. Miscellaneous Report No. 23. May 1940. p. 10.

a group of rules to follow when circumstances indicate an increase or reduction of individual bases is needed or justified. The rules may also provide for the transfer of bases among individuals under certain conditions. While probably most associations adhere closely to a rather strict set of rules with respect to adjustment and transfers, some provide for the sale of all or part of a base by one member to another. Dissatisfied members in some markets have often raised the question of favoritism and special privilege regarding these policies.

TIMING AND LENGTH IMPORTANT

The timing and length of the base-forming period is of great importance in the effective operation of any base-surplus plan. In their survey of base plans, Weldon and Herrmann found that the length of the base forming period in 82 markets varied from 2 weeks to 36 months, with 3, 4, 6, and 12 months being the most common. The majority of associations studied, used the fall months to establish bases. November was used by cooperatives as a base month in more cases than any other single month.³

There is a tendency, of course, for markets operating under an open-base policy to change the length and time of the base-forming period from time to time as conditions indicate.

OTHER VARIATIONS NOTED

The remaining points 5, 6, and 7 - the extent to which total bases exceed fluid milk sales, the number of months during the year in which bases are used, and the relation of the base plan to the rest of the marketing program - also tend to vary among markets in form and degree. They are perhaps not as important as the first four points already discussed.

ANALYSIS OF THE MADISON BASE-SURPLUS PLAN

The Madison base-surplus plan has had a decided effect on the Milk Market. To analyze just what it had done, the amount of change in the seasonal milk production for the entire period was studied, the seasonal variations for three 5-year periods closely scrutinized, and the reduction in seasonality compared for the Madison producers and those of other areas.

SEASONALITY BEFORE AND AFTER ADOPTION OF THE PLAN

In the statistical analysis that follows an attempt has been made to evaluate the effect the base-surplus plan has had on the seasonal pattern of milk production in the Madison milkshed. Milk production data for the market go back to 1922. It, therefore, is possible to make some comparison between the seasonal pattern before the Madison Milk Producers adopted the plan and since.

³Welden, W. C., and Herrmann, L. F. Base Allotment or Quota Plans Used by Farmers' Cooperative Milk Associations. Farm Credit Administration. Miscellaneous Report No. 23. May 1940. p. 11.

Data for 1922-1929, inclusive, were used in constructing the seasonal pattern of milk production prior to the adoption of the plan. Although the association adopted the plan in 1929, the period from 1931-1947 was used in investigating the seasonal pattern since it went into effect. The years 1929 and 1930 were considered transition years during which producers needed time to adjust their dairy herd management and other farm management practices in the direction of greater uniformity of production in response to the incentives provided by the plan.

Data on average production per farm per day, by months, were assembled for essentially the same producers from 1922 through 1946. The total monthly deliveries were converted to an average per farm per day basis by months in order to account for any change in number of producers shipping and in the length of the month. This procedure made any measure of seasonal variation more precise.

The results of these calculations are charted for the entire period 1922-1947 in figure 1. The well-pronounced seasonal pattern which existed prior to 1929 has continued. However, the range between high and low months in the later years was less than in the earlier years. It also is significant that average daily production per farm increased over a period of years.

This showed up as even more important when an index of seasonal variation for the series of years was computed.⁴ (See figure 2.)

Figure 2 shows readily that the seasonal variation during the period prior to 1929 was substantially greater than the variation since 1931. In order to show this point more clearly, indexes of seasonal variation for the two periods were constructed, see table 1.

The range from high to low months for the period 1922 - 1929 is 60.6 compared with 27.0 for the period 1931 - 1947, or a decrease of over 50 percent in the later period.

Data in table 1 are plotted in figure 3. Figure 3 shows several significant changes in the seasonal production pattern in the Madison Market since the base-surplus plan has been in effect:

1. Production in the spring months especially May and June, declined considerably. At the same time fall and early winter production, September, October, November, and December, increased considerably.
2. Under the plan August replaced November as the low production month.
3. In the 16-year period, 1931 - 1946, taken as a whole, a marked evening-out of production was effected.

⁴In order to obtain an accurate index, the original data on average monthly production per farm were corrected for any long time trend by using 12-month moving average. The relative values for each month were calculated, and their medians corrected to give one seasonal index for each month.

FIGURE 1
MONTHLY AVERAGE OF DAILY MILK PRODUCTION PER FARM
MADISON, WISCONSIN, JANUARY, 1922 - APRIL, 1947

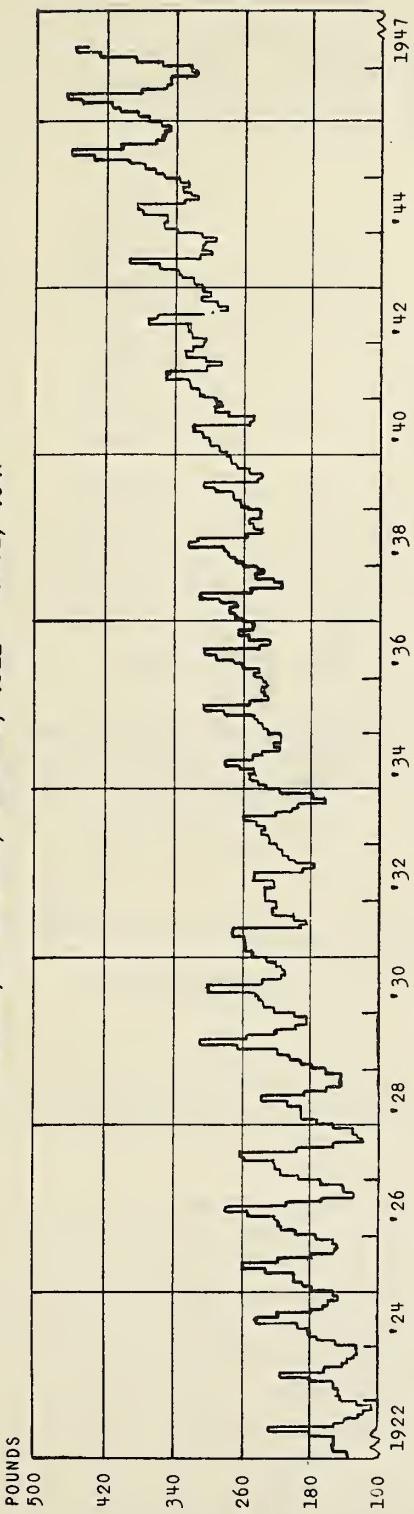
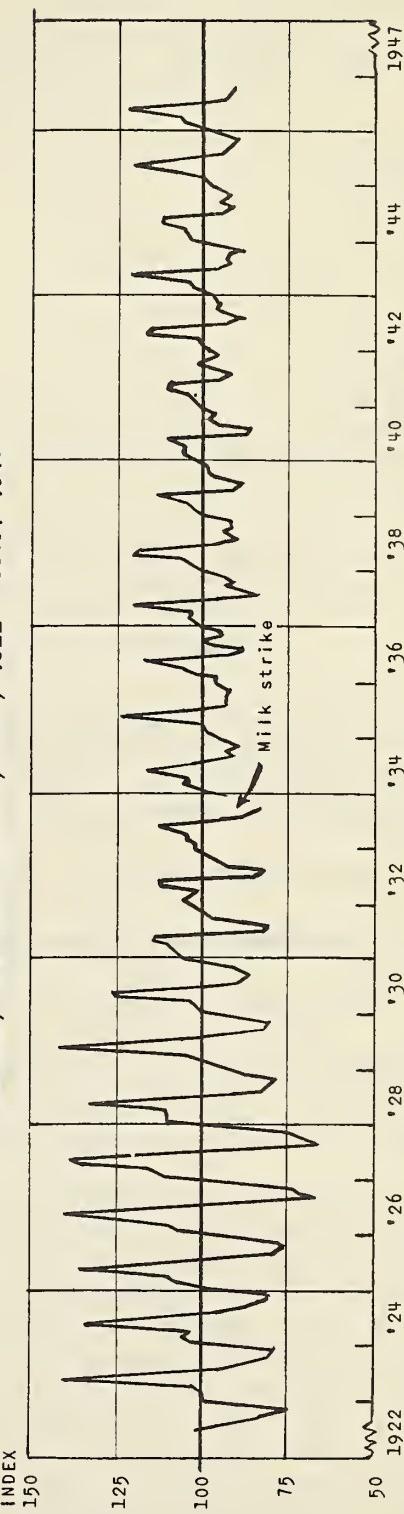


FIGURE 2
INDEX OF SEASONAL VARIATION IN PRODUCTION, BY MONTHS
MADISON, WISCONSIN MARKET, JULY, 1922 - OCT., 1946*



*Calculated from average production per farm per day - by 12 month moving average method.

Table 1. - Indexes of seasonal variation of average daily milk production per farm, Madison, 1922-March, 1929, and January 1931 - April 1947

Indexes		
March	January 1922-March 1929	January 1931-April 1947
January-----	98.2	99.7
February-----	103.2	102.3
March-----	107.7	104.4
April-----	107.4	104.5
May-----	121.1	112.2
June-----	137.7	115.3
July-----	106.7	95.1
August-----	92.6	88.3
September-----	82.0	93.1
October-----	80.1	95.8
November-----	77.1	94.5
December-----	86.0	94.4
Range - high to low----	60.6	27.0

COMPARISON OF SEASONAL VARIATIONS OF THREE-5-YEAR PERIODS

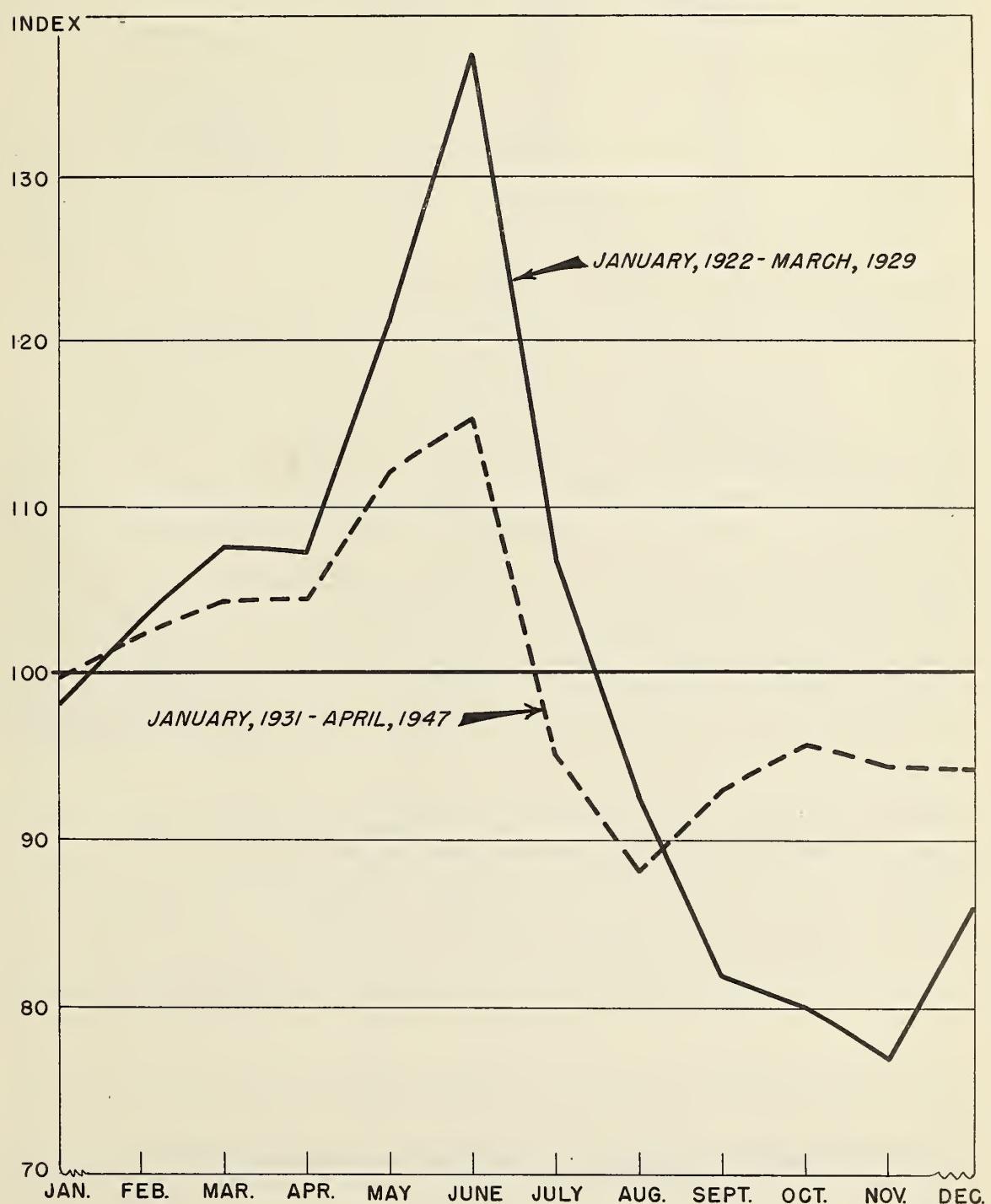
In the further analysis of the data, the 15-year period 1931 - 1945 under the base-plan was subdivided into three periods of 5 years each, for comparison purposes. These rather arbitrary subdivisions corresponded roughly to the following:

1. 1931-1935, inclusive - Depression period.
2. 1936-1940, inclusive - Recovery period.
3. 1941-1945, inclusive - War period.

Separate indexes of seasonal variation computed for the above three periods are given along with the indexes for the entire period in table 2.

These indexes are plotted in figure 4. Differences among the four curves are as a whole considered so slight as to be insignificant. The three 5-year periods showed seasonal patterns similar to each other and also to that of the entire period. June was high month and August low month in all cases. The period 1936-1940 had the greatest range - high to low month - while the war period, 1941 - 1945, showed the highest production index for August and September. The differences were minor in both cases, however. This higher production in August during the war period was probably due to the response of producers to including August in the base-forming period in the fall of 1943. The greatest part of the seasonal adjustment apparently took place during the first years under the plan and there was comparatively little adjustment thereafter.

FIGURE 3
INDEX OF SEASONAL VARIATION IN MILK PRODUCTION
MADISON, WISCONSIN, JANUARY, 1922 - MARCH, 1929
AND JANUARY, 1931 - APRIL, 1947



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FIGURE 4
INDEX OF SEASONAL VARIATION IN MILK PRODUCTION
MADISON, WISCONSIN, 1931-35, 1936-40,
1941-45, 1931-45

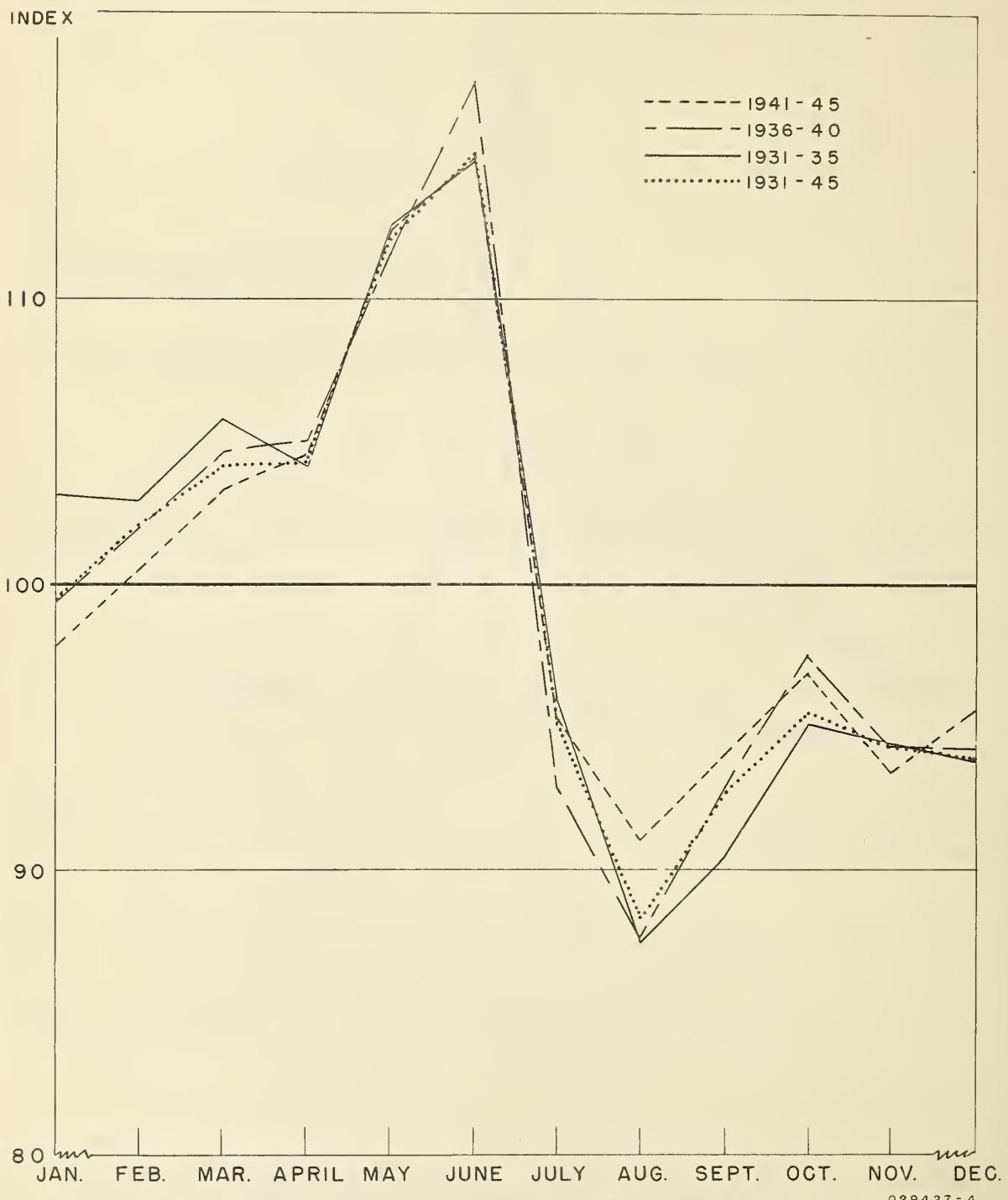


Table 2. - Comparison of indexes of seasonal variation of three 5-year periods with the 15 years 1931-1945 inclusive

Month	1931-1935	1936-1940	1941-1945	1931-1945
January-----	103.1	99.4	97.8	99.5
February-----	102.9	102.0	100.5	102.1
March-----	105.7	104.7	103.3	104.2
April-----	104.2	105.0	104.6	104.3
May-----	112.6	111.6	112.4	112.0
June-----	114.8	117.7	115.0	115.1
July-----	95.9	92.9	95.3	95.0
August-----	87.4	87.6	91.0	88.4
September-----	90.5	92.9	94.1	92.8
October-----	95.1	97.4	96.9	95.6
November-----	94.5	94.3	93.4	94.3
December-----	93.8	94.3	95.6	93.9
Range - high to low-----	27.4	30.1	24.0	26.7

SEASONALITY OF MADISON PRODUCERS COMPARED WITH OTHER PRODUCERS

What evidence is there that the reduction in seasonality in milk production of dairymen supplying the Madison market is closely associated with the base-surplus plan and not merely a reflection of a general trend in that direction for the area as a whole?

To answer this question, monthly data were obtained of daily average milk production on all Wisconsin farms for the years 1933 - 1944. These data, expressed in millions of pounds, were converted to a 12-month moving average, and indexes of seasonal variation then computed. These monthly indexes of seasonal variation for the State as a whole show a substantially greater range from high to low than do those for producers supplying the Madison market - 74.6 compared with 28.7. See table 3.

The same type of analysis was made for producers in Dane County delivering to the University of Wisconsin dairy plant located in Madison. These producers are from the same general area as the Madison fluid milk producers, and are farming under essentially the same conditions. Average daily production per farm was computed for the 5-year period 1942 to 1946 from monthly production totals. On the average, the series includes deliveries of about 60 producers. These farmers are not members of the Madison Milk Producers Cooperative Association. Furthermore they are not under a base-surplus plan.

As before, the data were corrected for any long time trend by means of a 12-month moving average, before computing indexes of seasonal variation.

Again the resulting index of seasonal variation shows a substantially greater range than does that of producers supplying the Madison market. See table 4.

Table 3. - *Monthly indexes of seasonal variation of milk production on all Wisconsin farms compared to Madison producers, 1933 - 1944*

Month	State of Wisconsin ⁵	Madison
January-----	80.2	98.5
February-----	88.7	101.8
March-----	97.7	104.3
April-----	110.1	104.4
May-----	133.1	111.9
June-----	145.9	117.3
July-----	122.5	95.5
August-----	103.4	88.6
September-----	91.4	93.2
October-----	82.7	96.9
November-----	71.3	93.4
December-----	73.4	94.1
Range - high to low-----	74.6	28.7

These comparisons indicate that use of the base-surplus plan by the association has to a considerable degree encouraged a more uniform production of milk by producers supplying the Madison market.

Table 4. - *Index of seasonal variation of average daily milk production per farm; producers supplying the University of Wisconsin Dairy Plant and the Madison Milk Producers*

1942 - 1946

Month	University producers ⁶	Madison producers
January-----	96.7	97.2
February-----	104.3	99.5
March-----	112.5	102.9
April-----	118.5	105.4
May-----	128.0	115.3
June-----	131.5	118.6
July-----	102.8	95.8
August-----	88.2	91.0
September-----	81.5	92.7
October-----	74.4	94.0
November-----	76.6	90.5
December-----	85.6	93.6
Range - high to low-----	57.1	28.1

⁵Computed from data on Daily Average Milk Production on farms. Wisconsin State Department of Agriculture, Wisconsin Dairy Production, Utilization, and Related Data, Bulletin 250. June 1945. p. 15.

⁶Indexes for university producers computed from records of the University of Wisconsin Dairy Plant.

INDIVIDUAL PRODUCER RESPONSE AND FRESHENING SCHEDULES

In order to study the production patterns and breeding schedules of individual producers participating in the base-surplus plan a check was made of the records of the Dane County Herd Improvement Association. This testing association began activities in April 1945. Therefore 1946 was the first complete year for which records were available. In all there were only about 30 Madison producers who tested with the Dairy Herd Improvement Association throughout the entire year 1946. From this number 14 producers were selected for study and divided into two groups of 7 each on the basis of their seasonal variation in production.

Group B consisted of producers whose production pattern was either similar to, or more extreme than that for the market as a whole. Group A producers, on the other hand, exhibited relatively slight seasonal variation in production, and considerably less than that of Group B and the market as a whole.

SEASONALITY OF GROUPS A AND B

Production data in the form of total monthly deliveries were obtained for each producer for 1946. Indexes of seasonal variation were computed by expressing the production of each month as a percentage of the average monthly production for the year.

Simple averages were taken to obtain a single index for each month for each of the two groups of producers. These averages were then corrected for the varying number of days in each month.

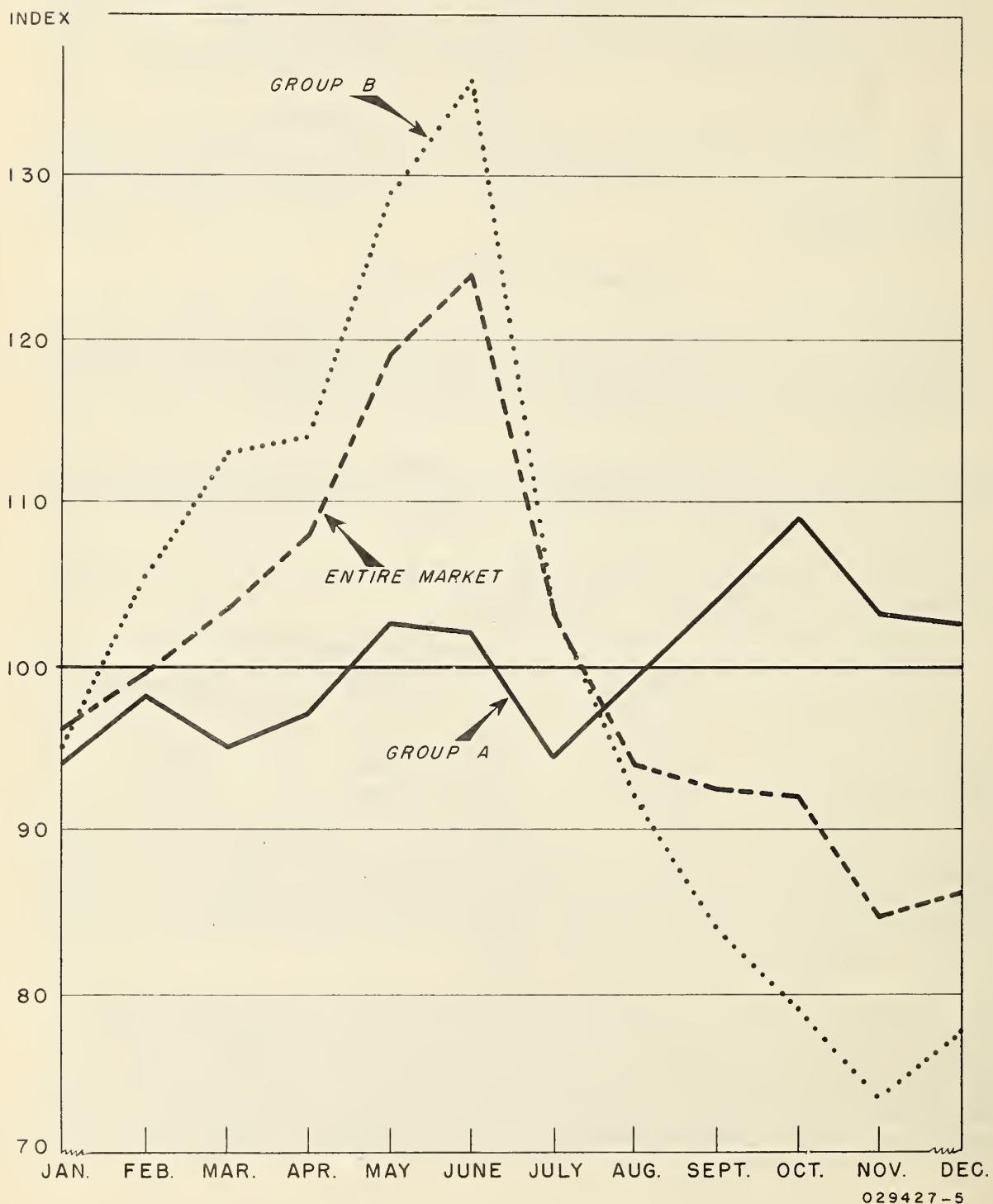
The range in production between high and low months for the two groups and for the entire market was as follows:

Producer groups	Production index		
	High month	Low month	Average range
A-----	109.3 (Oct.)	94.3 (July)	15.0
B-----	135.9 (June)	73.4 (Nov.)	62.5
Entire market-----	123.9 (June)	84.6 (Nov.)	39.3

These summary figures show that on the average the range in production between high and low month of Group B producers was four times greater than the range in production of Group A producers. However, the range in production for Group B producers was only 60 percent greater than the range in production for the entire market.

The indexes of seasonal variation in production of the three groups are shown graphically in figure 5. The general pattern of Group B producers follows rather closely the pattern for the Madison market except that the extremes of the flush months and low months are greater in the case of Group B. The seasonal production pattern of Group A producers on the other hand bears little resemblance to the other two groups except for

FIGURE 5
INDEXES OF SEASONAL VARIATION IN MILK
PRODUCTION, GROUP A, GROUP B, AND
ENTIRE MADISON MARKET, 1946



the pronounced drop in production from June to July. On the whole the Group A pattern tends to be just the opposite of that for Group B, and the entire market, especially so in the critical months from August to December.

SEASONAL DISTRIBUTION OF COW FRESHENINGS FOR GROUPS A AND B

Information concerning the difference in times when cows freshened on each farm was the primary source providing a partial explanation of the wide differences in the seasonal production patterns of the producers under study. This information was then obtained from Dairy Herd Improvement Association records for the same producers for which production data was secured. Because of the incomplete information on feeding practices, this information, although very important in a study of this type, had to be omitted.

The number of cows freshening each month for each producer was expressed as a percentage of the total number freshening during the year. These data are given in table 5.

Group A producers on the average had 34 percent of their cows freshen in the 3 months July, August, and September, while Group B producers averaged only 17 percent of the annual total during those 3 months.

Group B farmers have a relatively high proportion of cows freshening from January through May ...47 percent... as compared with Group A producers with only 35 percent. This situation would be a strong factor in swelling the volume of milk produced during the first pasture months in the spring.

Perhaps a more important consideration, however, involves the proportion of cows freshening in the month immediately following the flush production period. Group A producers have apparently adjusted their breeding programs in closer accordance with the base-surplus plan and the needs of the market so that greater number of cows freshened during July and August. Group B producers on the other hand apparently failed to control the breeding practices in this respect. Although they also had more cows freshened in the fall months than in the spring, they tended on the average to have relatively higher numbers of dry cows during the hot summer months of July and August, with increasing numbers of cows freshening about 2 months later than the producers in Group A.

Group B producers evidently made some effort to increase fall production relative to spring production through adjusting their breeding programs to have more cows freshen in the fall. Large numbers did not freshen until October and November, however, which was near the end of the base-forming period.

Group A producers with a higher proportion of July and August freshening cows apparently had little difficulty in maintaining and actually increasing fall production relative to spring production.

Table 5. - Percent of cows freshening each month in herds of Group A and Group B producers, and in herds of State of Wisconsin Dairy Correspondents, 1946

Producer	Avg. No. of cows	Percent freshening									
		Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.
Group A											
A-----	61	16.4	9.0	3.0	4.5	6.0	0	11.9	9.0	7.5	7.5
B-----	22	0	0	9.5	9.5	4.8	4.8	14.3	19.1	14.3	14.3
C-----	40	4.6	11.4	9.1	6.8	1.2	4.6	11.4	13.6	4.6	11.4
D-----	15	0	13.3	6.7	6.7	0	6.7	13.3	13.3	13.3	20.0
E-----	57	3.5	0	8.6	10.4	3.5	15.5	15.5	8.6	10.4	10.4
F-----	30	23.5	8.8	14.7	0	2.9	8.8	5.9	17.7	5.9	5.2
G-----	40	14.8	7.4	11.1	11.1	0	0	11.1	7.4	7.4	0
Simple avg.---	38	9.0	7.1	9.0	7.0	2.6	5.8	11.9	12.7	9.1	12.3
Group B											
T-----	33	20.7	17.2	13.8	3.5	3.5	0	6.9	0	6.9	3.5
U-----	19	12.5	4.2	8.3	8.3	0	0	4.2	20.8	8.3	20.8
V-----	25	0	30.8	23.1	3.9	7.7	3.9	7.7	0	3.9	7.7
W-----	34	17.1	8.6	5.7	14.3	11.4	8.6	0	8.6	2.9	17.1
X-----	15	11.8	5.9	0	17.7	5.9	11.8	5.9	0	0	17.7
Y-----	24	18.2	9.1	0	4.6	0	0	13.6	9.1	4.6	13.6
Z-----	22	17.4	13.0	0	0	13.0	4.4	0	4.4	13.0	21.8
Simple avg.---	24	14.0	12.7	7.3	7.5	5.9	4.1	4.9	6.9	10.2	13.0
Wisconsin State avg.*		10.7	10.8	12.2	8.5	6.2	4.9	3.5	4.4	7.0	10.1
											11.2
											10.5

*From records of the Wisconsin Crop Reporting Service.

The foregoing discussion and illustrations are not intended to give statistical proof as a basis for generalizations in this problem. The small sample was drawn and the results analyzed in an effort to isolate some evidence which would indicate roughly the relationship between the seasonality of milk production and the monthly distribution of cow freshenings - assuming all other factors are the same.

POSITION IN MARKET OF GROUPS A AND B UNDER PLAN

The same producers were grouped as before for the purpose of analyzing their production records in order to determine their relative advantage or disadvantage on the market. As an indicator of this, certain significant ratios were computed in accordance with market procedure under the base-surplus plan. Table 6 shows the results of these computations for each producer along with the group averages for each ratio or factor.

The following four factors were expressed as a percentage of each producer's average monthly production for the year 1946:

1. His base allotment established in 1946.
2. The amount which he failed to produce up to his base allotment.
3. The average monthly volume of base milk delivered.
4. The average monthly volume of surplus milk delivered.

Each producer's high production month was indicated, then the base milk and surplus milk delivered in that month were expressed as percentages of his average monthly production for the year and of the total annual production.

Group A producers who as a whole displayed relatively uniform production and a relatively high proportion of cows freshening in late summer and fall months established base allotments considerably higher on the average than did Group B producers whose flow of milk was much more irregular. Group A producers established bases averaging over 4 percent higher than their average monthly production, whereas bases of Group B producers averaged more than 17 percent below their average monthly production for the year. See column 1 table 6. The spread in this ratio, of course, is attributable almost entirely to opposing performances of the two groups during the base months in the fall.

The base allotment not used, or the extent of underbase deliveries of Group A, however, was on the average twice as great as that for Group B. See column 2 table 6. In other words, the producers in Group A with higher relative base allotments failed to produce up to their bases to the degree that producers in Group B did.

Producers in Group A carrying relatively larger proportions of base allotments to average monthly production naturally delivered relatively larger amounts of base milk and relatively lower amounts of surplus than did producers in Group B. Delivered base was 95.3 percent of average monthly production for Group A producers and only 78.8 percent for Group B producers. Or stated another way, delivered surplus was only 4.7 percent

Table 6. - Allotted base, base allotment forfeited, delivered base, delivered surplus as a percentage of average monthly production; base production and surplus production as a percentage of total production month; and high production month as a percentage of average monthly production and total annual production, Groups A and B producers, and all producers - Madison Market, 1946

Producer	Allotted base	Percentage of average monthly production			High production month as percentage of			High month as percentage of total annual production
		Base allotment forfeited	Delivered base	Delivered surplus	Base production	Surplus production		
Group A								
A-----	89.2	.7	88.5	11.5	71 Mar.	29	126	10.5
B-----	99.3	3.3	96.0	4.0	87 Oct.	13	114	9.5
C-----	100.3	3.1	97.2	2.8	82 Dec.	18	123	10.2
D-----	116.0	17.9	98.1	1.9	89 Oct.	11	130	10.8
E-----	114.2	15.8	98.4	1.6	90 Oct.	10	127	10.6
F-----	115.7	18.1	97.6	2.4	89 Sept.	11	130	10.9
G-----	94.4	3.0	91.4	8.6	73 May	27	130	10.9
Simple avg. ---	104.2	8.8	95.3	4.7	83	17	126	10.5
Group B								
T-----	80.8	2.9	77.9	22.1	57 May	43	142	11.8
U-----	66.7	.6	66.1	33.9	49 May	51	137	11.5
V-----	94.2	11.2	83.1	16.9	66 May	34	143	11.9
W-----	91.4	3.8	87.6	12.4	59 June	41	155	12.9
X-----	97.5	8.5	88.9	11.1	66 June	34	148	12.4
Y-----	68.6	.7	70.7	29.3	50 Mar.	50	138	11.5
Z-----	79.3	1.7	77.6	22.4	58 June	42	137	11.4
Simple avg. ---	82.6	4.2	78.8	21.2	58	42	143	11.9
Madison Market	91.0			9.9	75 June	25	122	10.2

of average monthly production for Group A producers and 21.2 percent for Group B.

Total production during the high month as a percentage of average monthly and total annual production for Group B producers was in every case considerably higher than that for those in Group A.

ECONOMIC CONSEQUENCE OF ADJUSTING TO MORE LEVEL PRODUCTION

The foregoing analysis gives a basis for understanding the economic advantage possible under a base-surplus plan through more uniform production as compared to uneven production. Obviously dairymen with the highest proportion of base milk and the least surplus will receive higher average prices over the year.

An attempt was made to illustrate roughly the possibility of making more money for the average producer who has made the adjustment under the base plan toward more uniform production. An annual average gross income figure was arrived at for the period 1931-1942 by applying monthly average base and surplus prices actually paid Madison producers during those years. The average annual base price paid was \$2.04 per hundredweight. The surplus brought \$1.40 per hundredweight.

The difference between the average price received for base and surplus milk was 64 cents per hundredweight.

These prices were then applied in computing an average annual total gross income figure from the sale of all milk and an average weighted annual price for all milk sold in each of four cases as follows:

1. An "average producer" of 300 pounds of milk per day or an average monthly production of 9,000 pounds was assumed in all cases.
2. It was assumed that this average producer had a seasonal production pattern identical with that for the market as a whole from 1922-1929. Similarly the same "average producer's" output was given proportional monthly weightings according to the seasonality of production for the entire market from 1931-1942.
3. In each case, the 4 months, August through November, were used as the base months, and the relative amounts of milk sold each month at base and surplus price levels were computed, assuming the base to be constant throughout the period.

Under the conditions assumed, the producer who adjusted his seasonal production pattern to that prevailing for the market as a whole from 1931 through 1942, averaged \$80 more, annually in gross income from the sale of milk than the same producer whose seasonal pattern was identical with that shown for the entire market from 1922-1929. The weighted average annual price paid for all milk sold was \$1.96 per hundredweight, and \$1.88 per hundredweight, respectively, or a difference of 8 cents per

hundredweight in favor of the producer who had made the adjustment to more uniform production.

These calculations illustrate in principle the way in which producers may benefit financially during a year or over a period of years, when they adjust their production to a more level pattern under a base-surplus plan. If they go even further in that direction the way Groups A and B did the increases in gross returns would be even greater.



